The Economics of Reducing Health Risk from Food

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Julie A. Caswell

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PART TWO: Evaluation Criteria for Reduction of Health Risks from Pathogens

3. Setting Priorities in Foodborne Pathogen Data: Public and Private Response

Helen H. Jensen, Tanya Roberts,
Laurian Unnevehr, and Shannon Hamm

Food Marketing Policy Center
Department of Agricultural and Resource Economics
University of Connecticut

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Helen H. Jensen (hhjensen@iastate.edu)

Tanya Roberts (tanyar@econ.ag.gov)

Laurian Unnevehr (laurian@uiuc.edu)

Shannon Hamm

Department of Economics
Iowa State University, Ames, IA 50011-1070

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Setting Priorities in Foodborne Pathogen Data: Public and Private Response

Helen H. Jensen, Tanya Roberts, Laurian Unnevehr, and Shannon Hamm[1]

Based on growing evidence, foodborne disease is one of the more common and important causes of U.S. illness. Estimates of illness range between 6.5 and 33 million cases of illness and up to 9,000 deaths a year have been attributed to foodborne microbes (Roberts and Unnevehr 1994, citing CDC and FDA). Foodborne pathogens account for an estimated $5-6 billion in costs to society. The public policy objective, as articulated in *Healthy People 2000*, is to significantly reduce infections caused by key foodborne pathogens, specifically the four most common foodborne bacterial sources: *Salmonella*; *Campylobacter jejuni*; *Escherichia coli* O157:H7; and *Listeria monocytogenes*. However, despite the public recognition of the severity of the problem, there is very limited information available on which to base public policy decisions and to assess relative risks of exposure to illness from foods. Data are needed to identify and evaluate foodborne pathogens and control options, and to improve allocation of public and private resources for managing and controlling microbial risks in meats and poultry products.

The problem of the lack of information on foodborne pathogens, their incidence, and costs, and the need to review public priorities were primary motivations to gather government, industry, and academic researchers and policymakers for a conference. The conference, organized by members of the NE-165 Regional Research Project and held in Washington, D.C. in January 1995, was entitled *Tracking Foodborne Pathogens from Farm to Table: Data Needs to Evaluate Control Options*. Its primary objective was to identify information sources for improved decision making and research on reducing foodborne disease.

The success of the conference was evident from the broad based participation of researchers and policy makers from various disciplines (veterinary medicine, epidemiology, public health, economics, and consumer interest, among others), as well as industry and consumer representatives, to address the needs for better data to support public and private response to foodborne pathogen hazards. The papers and the discussion addressed the need for developing a system of data to protect public health and manage the risks from unsafe meat and poultry. In this chapter we summarize the public policy problem, discuss data issues related to the policy problem, address particularly the economic information in terms of the potential development and use of data sources, and finally identify data bases available for use in tracking the foodborne pathogens in the food system and evaluating control options.

The Public Policy Problems

In the last 10 years there has been significant progress in the scientific knowledge about foodborne disease, including improved tests identifying pathogens and advances in epidemiology related to

pathogens in meat and meat products. In some cases, traditional human illnesses have been newly linked to foodborne pathogens, and in other cases, new diseases and potential sources of contamination have been identified. The 1993 outbreak of *E. coli* O157:H7 associated with hamburger brought increased public attention to new risks, namely the possibility of kidney failure from eating medium rare hamburgers eaten anywhere. Subsequent outbreaks have demonstrated this was not an isolated instance of contamination, and have reinforced the public perception that eating hamburger medium rare (140°F) is risky.

New scientific knowledge and increased public awareness of risks associated with pathogens in meat and poultry have led to calls for improved regulation—and information—on pathogenic microorganisms. That children and other sub-populations are at greatest risk to foodborne pathogens is a dimension of the problem that has heightened public concern. Also, from a public policy perspective, the difficulty in tracing back to the source of the problem even when the final food source was well documented, shows the difficulties in and necessity of developing strategies for controlling foodborne hazards.

Existing regulatory structures and the federal and state inspection systems do not fully meet the needs for controlling foodborne bacteria, parasites, viruses, and fungi. While any food can become the vehicle for these pathogens, animal protein products (meat, poultry, eggs, dairy products, seafood) are their primary vehicles. In some cases, human pathogens are deposited on the products during food preparation and handling. And, this product contamination cannot be identified by consumers (or the current inspection system) by smell, sight, or touch. The nature of food production today is complex and the potential for contamination exists at all stages of processing.

Data Issues Related to Public Policy

Four aspects of food safety relate to data used to inform public policy. First, food safety data present a bad news/good news dilemma. In the short run, we have to be willing to endure more "bad news" as more information verifies the extent of human illnesses related to pathogens. As several speakers mentioned at the conference, "We can't manage what we can't measure." Currently, greater efforts are being directed to measure the level of safety (i.e., levels of contamination or hazard) in products. Also, since consumers play a role in producing safer food, primarily by how they handle food at home, data on changes in consumer information and behavior are also needed, and any changes need to be accounted for in the development and implementation of public policies.

In the longer run, data collection will produce more "good news" of improvement in food safety. A recent report indicated that listeriosis cases have declined, largely because of industry and government control efforts (Tappero et al. 1995). This study finds a significant decline in the incidence of listeriosis in 1993 compared to 1989, and associates the reduction with industry, regulatory, and educational efforts. A problem, however, is that the "bad news" often sets priorities for public policy, at times without the broader context provided by improved information about food safety priorities.

Second, we do not have a well-developed and integrated information base on which to make public policy decisions. Foodborne illnesses are sporadically reported to the Centers for Disease Control and Prevention (CDC) and the reports rarely provide evidence of a specific food source. Also, food production and distribution today is complex. The potential for contamination exists at all stages of processing and data are needed to link foodborne pathogens at different stages of the food system. Without this basic information, estimates of exposure, assessment of risk, and public strategies toward risk and on control are difficult to develop.

Third, costs of acquiring information are high. Thus, food safety is a public good because the information about the good (safe food) is too costly for any individual participant to produce. Even when data are available to producers, private industry holds some proprietary interest in not disclosing all of

the data. Furthermore, available information is likely to be asymmetric among producers, processors, and consumers. That is, producers or processors are likely to know more about the safety level of their products than the processor or consumer at the next level down the food chain. This has led to some private initiative in contracting with suppliers based on criteria of process control in production. However, in general, the lack of full information makes it more difficult to rely on private markets and incentives to bring about the socially desirable and efficient level of food safety.

Finally fourth, distributional issues are important considerations. Some new technologies of control may be prohibitively expensive for small (inefficient) producers to adopt. Decisions about regulation of food safety levels may have differential effects on producers. And, the benefits of improved food safety are likely to be valued by some consumers more than others: particular groups at high risk (young children, the elderly, those with immunosuppressed diseases) will benefit more than others. These effects suggest that there will be gainers and losers to consider from any change in regulation.

The need for redesign and rethinking of the sources and exchange of data is linked directly to the development of public policy and regulation of food safety. Both public and private participants have incentives to acquire and use information on food safety. However, public and private information needs are often in conflict.

There is a need for public data for monitoring the level and change of safety achieved in order to identify effective public policies and programs. From the public perspective, data are needed also to set priorities for public interventions, to determine effective control options and strategies for both the public and private firms to address food safety problems, and to evaluate change. The criteria used in deciding how to allocate scarce public and private funds for food safety control will guide the types of data most useful to the public decision making process. Ideally, the policies can achieve improved food safety levels while at the same time provide incentives for innovation in production and technologies to achieve better safety.

Unfortunately, current academic and agency structures do not always foster the cooperation necessary to develop the data needed. Systems for data collection are very expensive and require the ability to link data through the food chain. Without an integrated data system, it is difficult to address the potential system-wide effects of control at any point in the food chain. Greater attention is needed on ways to solicit interdisciplinary involvement, and to leverage cooperative science and data collection to develop needed data systems. The National Research Initiative (NRI) program is a vehicle for fostering multi-disciplinary coordination. The focus on an *integrated* system of data is one approach to foster cooperation and common exchange of information. The conference identified possibilities for developing a clearing house for information.

Economic Information

To date, except for cost of illness estimates (e.g., Roberts and Unnevehr 1994) and preliminary willingness to pay estimates from experimental data (e.g., Hayes et al. 1995), there are relatively little data available on the economic aspects of food safety. Economic information is basic to developing successful public policies and programs. A key aspect of the problem is that the pathogens cannot be detected organoleptically and obtaining information is very costly for consumers. Since consumers cannot see or smell these pathogens, they cannot detect the level of safety of the animal products they purchase. Markets fail to provide consumers the information needed to assess the safety of meat and meat products. Hence, producers lack incentive to improve food safety and consumers lack a mechanism to effectively "communicate" their demand for safer food (willingness to pay).

Economic information is needed by policymakers on the costs of supplying various levels of food safety and the structure of costs (average and marginal costs) of using different techniques to supply

increased food safety. This includes the need for information about the costs to firms of changing production practices, including the implementation of control strategies like HACCP. Then relative/marginal costs of control can be weighed against marginal gains in the safety of the foods to obtain information on the cost effectiveness of various strategies for food safety control.

The public policy issue which ties economics to the problem of reducing health risk from food is the degree to which public or private assurance of a safe food supply exists and how alternative regulatory strategies can provide incentives or controls to bring about a safer food supply. For this purpose, data are needed to identify the magnitude of the current foodborne disease problem and identify which pathogens are causing the greatest costs to society; to identify high-risk consumers (by age, genetic susceptibility, other underlying disease, high-risk foods consumed); to identify possible control options and assess the comparative advantage of private or public risk reduction strategies; to estimate consumers' willingness to pay for reduction of foodborne risks; and to assess the costs and benefits of pathogen control options at the various links in the food chain.

The need for research includes also developing a better understanding of consumer response to risk and information, and of the effectiveness of differentiating food products through labeling or other marketing techniques. Identifying groups of consumers at high risk to specific foodborne hazards, and informing these consumer groups of their higher risks is one way to foster the development of niche markets for higher levels of food safety than may exist in the general market. Food labels which provide information on the relative risk of the food foster the development of such private responses.

Databases to Track Foodborne Pathogens from Farm to Table

The conference *Tracking Foodborne Pathogens from Farm to Table* brought to attention the need to gather in one place databases related to foodborne pathogens. The key tracking points in the food continuum where primary data exist include animal prevalence studies from the National Animal Health Monitoring System (NAHMS); individual dietary data to identify consumption habits of high-risk foods and populations from the Agricultural Research Service and the Department of Health and Human Service's National Center for Health Statistics (NCHS); and human illness data primarily from the Department of Health and Human Services (HHS)'s Centers for Disease Control and Prevention. Several of the conference papers described the data sets in detail and identified their importance in identifying foodborne pathogens (e.g., Haddix et al. 1995). Most of the national data sets available are listed in Table 3.1 and discussed in greater detail in Hamm (1995).

An important public source of data comes from the NAHMS, sponsored by the Animal and Plant Health Inspection Service (APHIS) of USDA. The Veterinary Services (VS) part of APHIS responded to industry needs to increase information on endemic and noninfectious animal disease losses and their association with different production practices. The NAHMS was created in 1983 to fulfill this mission to identify users and information needs and to generate and distribute epidemiologic and economic data in an effective and efficient manner. Between 1983 and 1988, the epidemiologic and economic data concerning cattle, sheep, swine, and poultry in breeding, feeding, and other types of operations were collected in seven states. National surveys began in 1989 with the National Swine Survey. Several studies based on the NAHMS now exist relating to foodborne pathogens and are summarized in Hamm (1995).

In addition, a possible source of data on alternative control options comes from industry sources. Industry data at the processing level are plant specific and depend on the unique product mix, sampling program, and reporting procedures, and consequently are hard to compare across firms. However, access to industry data is limited because of trade secrets and the legal liability potentially arising from pathogens in foods. The establishment of a clearing house of information would facilitate the sharing of information. Although more plants are likely to adopt HACCP procedures and have data available

TABLE 3.1 Foodborne Pathogen Databases Available at the Farm, Consumption, and Human Illness Levels

Farm Level Databases

National Animal Health Monitoring System (NAHMS):
- National Swine Survey
- Swine Slaughter Surveillance Project
- National Dairy Heifer Evaluation Project (NDHEP)
- *Escherichia coli* 0157:H7 in U.S. Dairy Calves
- *Salmonella* in Dairy Calves
- Cow/Calf Health and Productivity Audit (CHAPA)
- *Cryptosporidium* and *Giardia* in Beef Calves
- Cattle on Feed Evaluation (COFE)

Consumption Level Databases

Agricultural Research Service:
- Continuing Survey of Food Intakes by Individuals (CSFII)
- Diet and Health Knowledge Survey (DHKS)

Economic Research Service and Agricultural Research Service:
- U.S. Food and Nutrition Supply Series

National Center for Health Statistics, Centers for Disease Control and Prevention:
- National Health and Nutrition Examination Survey (NHANES)

Food and Drug Administration:
- Consumer Food Handling Practices and Awareness of Microbiological Hazards

Human Illness Databases

National Center for Health Statistics, Centers for Disease Control and Prevention:
- National Health Interview Survey (HNIS)
- National Hospital Discharge Survey (NHDS)
- National Mortality Followback Survey (NMES)
- National Hospital Ambulatory Care Survey (NHAMCS)
- National Ambulatory Care Survey (NAMCS)
- National Medical Care Utilization and Expenditure Survey (NMCUES)
- Vital Statistics
- National Health and Nutrition Examination Survey I Epidemiologic Follow-Up Study
- Behavioral Risk Factor Surveillance System (BFRSS)

Food and Drug Administration:
- Biotechnology Information for Food Safety (BIFS)

on their processes, this information will not be tied directly to input use, prices, and value of output. Evidence from plants of various sizes and types would greatly enhance the available information base for economic analysis designed to assess alternative control options.

Concluding Comments

Setting priorities for collecting more data on foodborne pathogens implies that criteria exist as well as plans about how the data will be used. Economists can help to clarify how those priorities are set. What criteria should be used to set priorities for collecting more data on foodborne pathogens? Roberts et al. (1995) review several priority-setting rationales for identifying the most "important" foodborne pathogens and make the case for explicit, verifiable criteria. As economists, we favor defining the issue in economic terms. Cost of illness indicators provide a good start at aggregate data in order to compare the relative magnitude of the economic problem posed by foodborne illness relative to other illnesses. Ranking pathogens according to their respective cost of illness would provide one way of prioritizing information needs among pathogens. Such estimates implicitly account for the distributional effects of foodborne illness in its effects on children through their high value of life, but additional indicators might be developed to take account of other distributional dimensions of the problem.

Beyond setting priorities among pathogens, the general question we need to ask is: "What are the marginal benefits of better data on foodborne pathogens in being better able to evaluate alternative control procedures?" For example, using probabilistic scenario analysis, Griffin and Miller (1995) found that the bulk of the risk from the pine shoot beetle to the forestry industry could be reduced by implementing one control strategy. The cost savings from not implementing the other 24 strategies, as planned by the state of Michigan, is a measure of the value of the information. Analogous to returns to research, it is easier to know ex post how valuable the information was than to estimate ex ante how valuable it might be. However, improved microbiological models will enable better ex ante estimates. Avoiding unnecessary or costly control options is one important reason to improve data collection.

Since the human illness costs (medical costs and productivity losses) are currently several billion dollars (USDA 1995) compared to federal foodborne pathogen control programs' cost totaling $1 billion (GAO 1992) and industry costs that are also considerable, increasing spending to identify more explicitly the nature of the foodborne disease and control options appears to be very cost effective. New technologies for making data available in a cost effective manner and readily accessible are becoming more widespread. The critical need at this point is to collect data that will meet the needs for controlling food safety levels and inform public decision making.

In the U.S., several initiatives are likely to produce better data for tracking foodborne pathogens through the food system. A new federal initiative, that will involve state offices as well, is the FSIS-CDC-FDA initiative for surveillance of diarrheal diseases at sentinel sites. This effort will help establish food linkages for a set of foodborne pathogens that will be covered. In the case of *Listeria*, Tappero et al. (1995) attribute the success in reducing disease incidence by 44 percent from 1989 through 1993 to both regulatory and industry initiatives. This improvement occurred once the problem was identified and set as a high priority in public concern. However, data on the actual changes in the industry, and related economic analysis, are limited. Both private and public coordination will be required to match the need for data with the availability (and potential) for data generation and collection.

Note

[1]Helen Jensen is Associate Professor, Department of Economics, Iowa State University; Tanya Roberts and Shannon Hamm are Agricultural Economists with USDA Economic Research Service; Laurian Unnevehr, formerly Agricultural Economist with USDA, is Associate Professor, Department of Agricultural and Consumer Economics, University of Illinois. The views in this paper are the authors' and do not represent USDA positions. Partial funding support for the research came from Iowa State University, Food Safety Consortium.

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